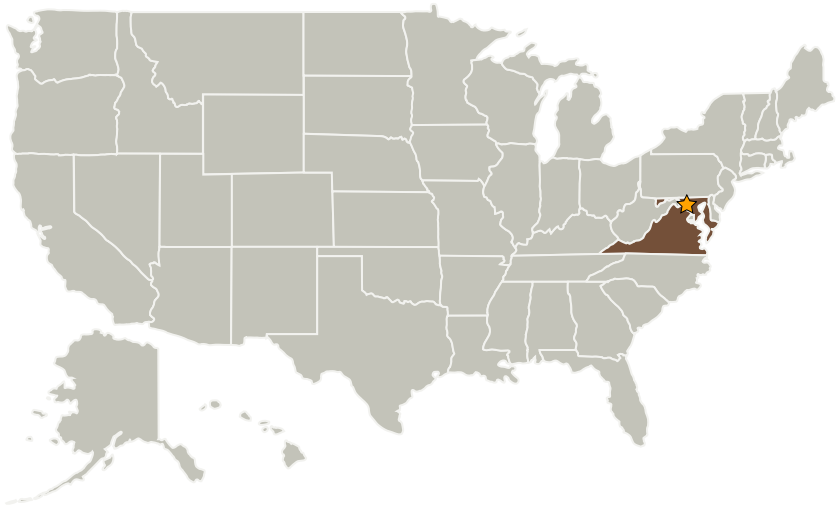
Synthetic Imaging Maneuver Optimization (SIMO), Phase I

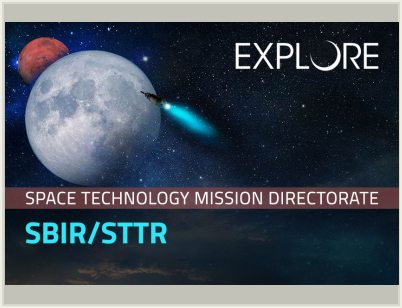
Completed Technology Project (2008 - 2008)

Project Introduction

Space-based interferometry missions have the potential to revolutionize imaging and astrometry, providing observations of unprecedented accuracy. Realizing the full potential of these interferometers poses significant technological challenges, including the efficient maneuvering of multiple collectors to various baselines; regulating the path-length of science light from the collecting telescopes to the combining instrument with nanometer accuracy, despite the presence of vibration; and demonstrating through hardware-in-the-loop simulation that spacecraft sub-systems can be coordinated to perform such challenging observations in a precise, efficient, and robust manner. We propose the Synthetic Imaging Maneuver Optimization (SIMO) program to develop a methodology, calibrated through hardware-in-the-loop testing using the SPHERES testbed, to optimize spacecraft maneuvers to more efficiently synthesize images for missions such as Stellar Imager. Time and fuel-optimal maneuvers are only a part of the optimization problem. Selecting the maneuver waypoints (number and location) determines the quality of the synthesized image. The number of spacecraft, the size of the sub-apertures, and the type of propulsion system used also impacts imaging rate, propellant mass, and mission cost. Capturing all of these mission aspects in an integrated mission optimization framework helps mission designers to select the most appropriate architecture for meeting the needs and constraints of future missions.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Aurora Flight Sciences Corporation	Supporting Organization	Industry	Cambridge, Massachusetts

Primary U.S. Work Locations	
Maryland	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Joseph C Parrish

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.4 Vehicle Systems
    - TX09.4.7 Guidance, Navigation and Control (GN&C) for EDL